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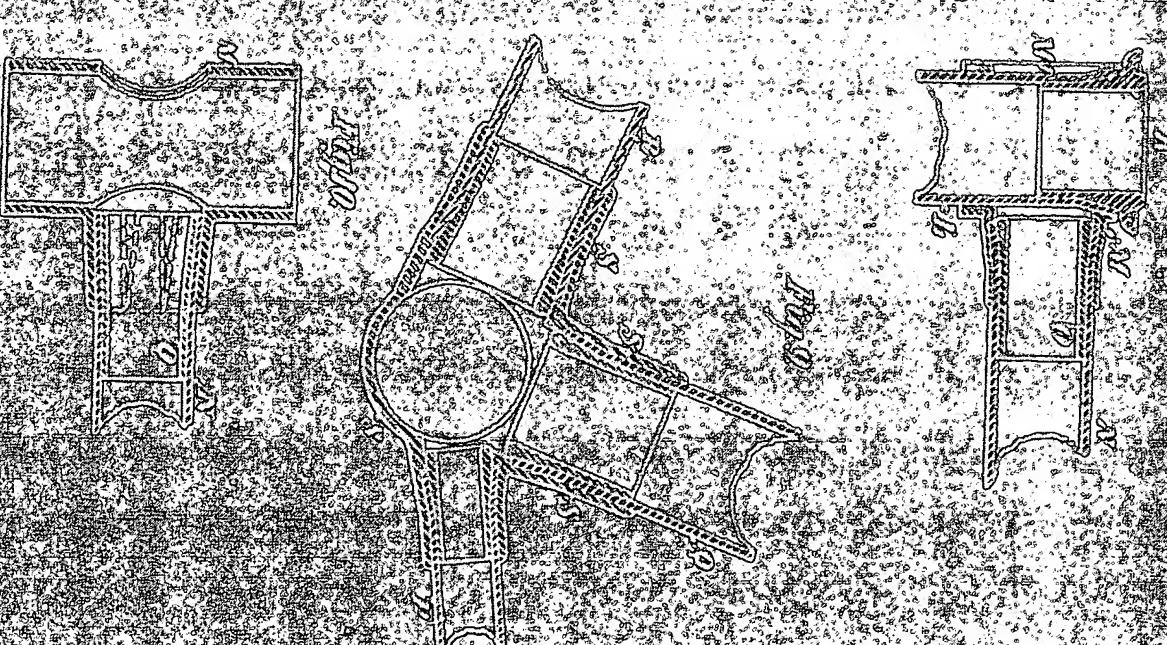
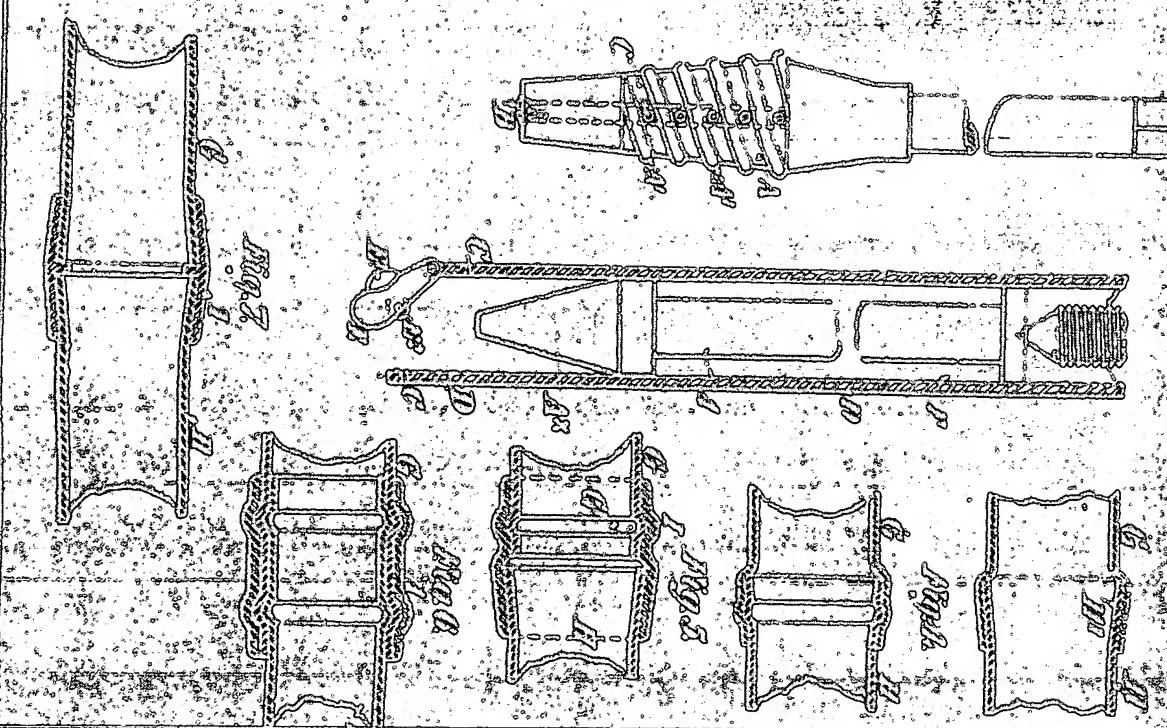
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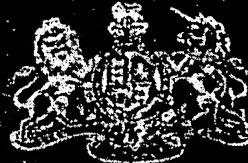
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N° 27,645



A.D. 1896

Date of Application, 4th Dec., 1896

Complete Specification Left, 3rd June, 1897—Accepted, 31st July, 1897

## PROVISIONAL SPECIFICATION.

## Improvements in the Process and Apparatus for Fixing Metallic Tubular Pieces on each other, applicable to Cycle and other Framing or Tubing.

I, PETER JENSEN of 77 Chancery Lane London Chartered Patent Agent, do hereby declare the nature of this invention, a communication to me from abroad by the Firm of Hoyer & Glahn of Schönebeck on the Elbe, Germany, Manufacturers, to be as follows:—

5 It has heretofore been proposed to join tubular pieces without soldering or brazing and the consequent danger of deteriorating by high heat, by forming grooves in the outside of one piece by means of a contracting tool and after inserting in the other piece forming corresponding grooves in the latter; also by forming the grooves in one piece from within by an expanding tool and after placing it upon the other piece forming corresponding grooves in the latter; by another process the two pieces were 10 placed upon each other, and the grooves then made in both by one operation, and either from within by an expanding tool or from without by a contracting tool. It has also been proposed to form grooves in one of the pieces and after assembling the two pieces forming corresponding grooves in the other piece by means of liquid or 15 hydraulic pressure acting within the inner piece.

The aforesaid processes suffer more or less from the defect that the joints so made after a time, when used in a cycle frame or otherwise where they are exposed to continual packing motions become more or less loose or shaky.

Our process which is applicable to all the aforesaid processes consists firstly in 20 coating the pieces to be joined with tin or other thin fluid metal or alloy previously to the formation of grooves or indents in the one or in both the pieces or previously to assembling them, and secondly in heating the outer piece, by gas jets or otherwise so as to expand it to a suitable regulated degree, it being understood that the inner piece is of such a size as to require to be driven in by a light blow or pressure into 25 the heated outer piece. When the pieces the outer piece being hot have been indented in one of the modes described and have cooled down they fit permanently tight on each other; the tin forming the required soft medium between them to ensure accurately fitting surfaces in contact and the filling in of any minute cavities between them.

30 Another improvement which is applicable to all expanding tools for making grooves, annular, helical or otherwise, or indents of any suitable form, in the tubular pieces to be united, consists in providing an oil chamber in the mandril tool, said chamber being closed by a screw plug and provided with small holes for the issue of the oil to the acting parts of the tool. By this means the grooves or indents can be made more uniformly smooth, all danger of fretting or roughening of the surfaces in contact is avoided, and the process can be performed more easily.

In mandril tools for forming cup shaped or other indents the mandril is enclosed in a tube to the forward end of which are hinged three or more cams with projections of the cup or other desired form for indenting. The mandril at its forward end is made

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## JENSEN'S IMPROVEMENTS IN FIXING METALLIC TUBULAR PIECES ON EACH OTHER.

central, so that when brought forward in its tube by screw motion or otherwise the outer end acts upon the binding cams and presses them against the inside of the tubular piece to be indented. Behind the cams is provided an annular oil distributor and the tube has at its forward end small holes which allow the escape of oil to the acting parts of the binding cams when the mandril is brought forward to and upon the said cams.

Another part of the invention consists in improved forms of joints for uniting tubular pieces. The end of one piece is conically enlarged, or counterbored. This may be done for instance by cutting, or in case of steel iron or other expandable by means of a mandril working in a cone ring in three pieces. This outer piece and the other tube piece which is to be pushed into the central tube, are bored, and the outer counterbored tube piece having located the pieces are pushed together, and the joint may be further strengthened by forming grooves or indentations in any of the tubes described. A somewhat similar construction is applicable to the junction of the steering handle pillar ball bearing cap or ferrule and the steering socket. The upper end of the said socket is conically expanded by driving into it a ferrule made conical in its upper part and having the cap for the ball bearing bush for ball bearing and for junction part. The socket is so thick increased as to fill a conical recess turned into the tubular elbow piece, into which the upper member of the frame is to be fixed. This fitting is effected in a similar manner that is to say the end of the elbow piece has turned into it a conical recess into which the upper member of the frame is expanded by driving into it a ferrule inserted through a hole in the elbow piece and which is counterbored as aforesaid, and indents may also be formed for further security.

In a similar manner the three members of the tubular frame are united to the tubular socket piece carrying the bush and the bearing for the front wheel. The end of the tubular piece which is to be expanded by means of the ferrule may be cut up into lips or tongues.

Dated this Fourth day of December 1896.

JENSEN & SONS,  
76 Chancery Lane, London, W.C., Patent Agents.

## COMPLETE SPECIFICATION

## IMPROVEMENTS IN THE PROCESS AND APPARATUS FOR FIXING METALLIC TUBULAR PIECES ON EACH OTHER, APPLICABLE TO CYCLES AND OTHER FRAMING OR TUBING.

I, PETER JENSEN, of 77, Chancery Lane, London, Chartered Patent Agent, do hereby declare the nature of this invention, a communication to the same abroad by the firm of Loyer & Cohn, of Stutteberg on the Elbe, Germany, Münchenerstrasse, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:

It has heretofore been proposed to join tubular pieces without soldering, or brazing, and in order to avoid the consequent danger of deteriorating the quality of the metal by heat, by forming grooves in the outside of one piece by means of a concreting tool and after inserting such piece in the other piece forming corresponding grooves in the latter; also by forming the grooves in the one piece from within by an expanding tool and after placing such piece upon the other piece forming

*Jensen's Improvements in Firing Metallic Tubular Pieces on each other.*

responding grooves in the latter. By another process described in my Patent specification No. 22807 of 1895 the two pieces were placed upon each other, and the grooves then made in both by one operation, and either from within by an expanding tool or from without by a contracting tool. It has also been proposed to make grooves in one of the pieces, and after assembling the two pieces forming corresponding grooves in the other piece by means of liquid or hydraulic pressure acting within the inner piece.

The aforesaid processes suffer in all or less from the defect that the joints so made are not firm, when used in a cycle-frame or otherwise where they are exposed to continual jacking motions becoming more or less loose or shaky. The reason is probably this that the granular parts, though fitting closely in each other when the expanding or contracting force is being applied, recede and thus unequally, by the elasticity of the tube material, when the force ceases, and minute interlocking spaces are thus formed, or in other words the fit is not absolutely tight.

This present process which is applicable to all the aforesaid and similar processes consists firstly in coating the tubular pieces to be joined with tin or other thin-fluid metal or alloy previously to the formation of grooves or indentures in the one or in both the pieces or previously to, or during the assembling of them or afterwards, and secondly in heating the outer tubular piece, by gas jets or otherwise, so as to expand to a suitable regulated degree, it being understood that the inner tubular piece is such a size or diameter as to require to be driven in by a light blow or pressure of the heated outer piece. When the pieces, the inner piece being last, have been heated in one of the modes hereinbefore described and have cooled down they fit snugly tight on each other, the tin forming the required soft medium between them to ensure accurately fitting surfaces in contact and the filling of any minute cavities between them.

Another improvement which is applicable to all expanding tools for making grooves, similar, helical, or otherwise, or indentures of any suitable form in the tubular pieces to be united consists in providing in oil chamber in the mandril tool, said chamber being closed by a screw plug and provided with small holes for the issue of the oil to the acting parts of the tool. By this means the grooves or indentures can be made more uniformly smooth, all danger of fracturing or roughening of the surfaces in contact is avoided and the process can be performed more easily.

Fig. 1 shews as an example a conical mandril A with raised helical ribs A<sup>1</sup> and a central oil chamber which is closed by means of a screw plug B. The oil flows out through the small holes C.

In mandril tools for forming cup shaped or other indentations the mandril A, shewn in longitudinal section, Fig. 2 is according to this invention enclosed in a tube D, the forward end of which are hinged three or more cams E with projections F of cup shape (or other desired form) for indenting. The mandril at its forward end A<sup>1</sup> is also conical, so that when brought forward in its tube D by screw motion or otherwise the cone end A<sup>1</sup> acts upon the hinged cams, which may each leave a slot F, and press them against the inside of the tubular pieces to be indented. The tube A<sup>1</sup> is provided in annular oil chamber G, and the tube D has at its forward end small holes C which allow the issue of oil to the acting parts of the hinged cams when the mandril is brought forward to act upon the said cams or their slots.

Another part of this invention consists in improved forms of joints for uniting tubular pieces.

As shewn in the longitudinal section, Fig. 3, the end of one piece G is conically enlarged or chambered, the small end of the chamber being at the outer end of the piece. This may be done for instance by casting or, in case of mild steel, iron, other expandible metal or alloy, by means of a mandril working in a cone ring in the piece. This tube piece G and the other tube piece H which is to be pushed into and joined thereto are turned, and the outer chambered tube piece G being heated, the pieces G and H are pushed into each other and the inner one H expanded

## Jensen's Improvements in Fixing Metallic Tubular Pieces on each other.

as shown at H, so as to fill the chambered part of the other. Or the tinning may be done during or after the assembling of the parts.

Fig. 4 shows a joint of this kind which is further strengthened by forming grooves or indent's in any of the modes described.

Fig. 5 shows a joint of the kind where the part I is a casting which is fixed to the tube piece G by forming an annular groove G, or at may be two such in the piece G corresponding to the groove in the piece I, this latter being driven on hot before the ends of the tube pieces G and H are expanded to conform to the inner shape of the socket piece I, the parts I, H and G should be tinned before during or after being put together. The groove in the socket I is by preference turned in on a lathe.

Fig. 6 shows another form of cast socket piece I for uniting two tube pieces G and H, and Fig. 7 yet another form where the uniting socket I is made conical toward both ends.

A somewhat similar construction is shown in Fig. 8 as applicable to the junction of the ball bearing cup or ferrule K of the steering handle pillar with the steering pillar, the socket L, the ferrule K thus serving both for ball bearing and for junction piece. The socket L is by this means expanded so as to fill a conical recess turned into the tubular elbow piece M into which the upper member N of the frame is to be fixed. This fixing is effected in a similar manner, that is to say, the end of the elbow piece M has turned into it a conical recess into which the said upper member N is expanded by driving into it a ferrule O inserted through a hole M in the elbow piece and which is conical outside to suit the said conical recess. The parts are tinned and the outer part heated as aforesaid, and indent's may also (as described with reference to Fig. 4) be formed for further security.

In a similar manner as shown in Fig. 9 the three members P, Q and R of the tubular frame are united by a three-armed socket piece O and the member R can be united at its upper end in a similar manner to the tubular socket piece carrying the fork for the front wheel.

The end of the tubular piece which is to be expanded by means of the cone ferrule may as shown in Fig. 10 be cut up into lips or tongues.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is

1. In processes for uniting tubular pieces by forming grooves or other indent's, the coating of the said pieces, and of the uniting sockets when used in such processes with tin or other thin-fluid-metal or alloy previously to, while or after assembling such parts and the heating of the outer piece or part so as to expand it to such a degree that the inner piece has to be driven into the outer heated piece by a light blow or pressure, for the purpose that after the grooving or indenting and tinning have been effected, the outer part shall be found to be firmly shrunk upon the inner piece, the tin serving to fill any minute cavities, between them, substantially as set forth.

2. In tools for making grooves or other indent's in tubular pieces for uniting them the application and use of an oil chamber with filling plug and with small outlet holes for lubricating the acting parts of the tool substantially as set forth.

3. In mandril tools for forming cup-shaped or other indent's the combination of the mandril with conical front end, an outer tube D to which one or more indenting cams are hinged to be actuated by the said conical front end, an oil chamber such as F and oil outlet holes in the tube substantially as described with reference to Fig. 2.

4. The forms of joint for tubular pieces substantially as described with reference to Figs. 3 to 10 and in connection with the process firstly claimed.

Dated this Third day of June 1897.

JENSEN & SON,  
77 Chancery Lane, London, W.C., Patent Agents.